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# A STUDY OF THE COST OF RICE PRODUCTION

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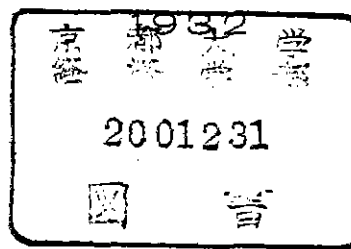
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# A STUDY OF THE COST OF RICE PRODUCTION

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### 1. THE OBJECT OF THE INVESTIGATION OF THE COST OF RICE PRODUCTION

In present-day agricultural economy, in which importance is attached to production for marketing or commodity production rather than to production for supplying the producer's own needs, it is a matter of great importance to know at what prices the produce should be sold or at what prices the means of production and commodities for consumption should be purchased. In the economy of small farmers, which depends mainly on family labour, there is, of course, no need for hired labour, and consequently no definitive defrayals of wages are required, as in the case of big enterprises on capitalistic lines. But it nevertheless needs goods for consumption which are socially necessary for producing and re-producing labour, so long as agricultural production is carried on with family labour. These goods for consumption constitute the cost price of family labour. Farmers can look to goods of their own production for the supply of some of these goods for consumption, but they must purchase the major part of these requisites from the market. In either case, the expenses must be estimated in the cost of production, as otherwise small farmers will be unable to maintain their standards of living and be compelled to abandon their agricultural production work. It is hardly

correct to regard the utilisation of family labour as a special advantage of small farmers' economy, as Tschajanow does, and put too much emphasise on the fact that such labour does not involve any definite defrayals of wages. Tschajanow<sup>1)</sup> attempts to explain the tenacity of this labour on certain peculiar psychological grounds but this is to make too light of the fact that the production and re-production of family labour essentially require goods for consumption which are socially necessary ; In other words, he is apt to make light of the fact that the cost of a unit hour of family labour is determined by the quantity of these goods for consumption and that in present-day agricultural economy, farmers necessarily depend largely on the market for the supply of these goods. Such being the case, the formation of income in the present-day agricultural economy, which aims chiefly at the production of commodities, depends, on the one hand, on the prices at which agricultural products are sold, and, on the other, on the prices at which the means of production and goods for consumption are bought. A clear idea of this income formation can be obtained only when the prices of agricultural products are contrasted with the cost involved in their production. It is absolutely necessary for farmers to have an accurate knowledge of the cost of producing their products, for such knowledge helps them to judge correctly of the prices which their products must fetch in order to make their production a paying business, or the prices which enable them to maintain their present standards of living. On the other hand, by an analysis of items of the cost of production, they can see which items are unreasonably dear, and judge whether their high prices are not due to some defective utilisation of the factors of production in the process of agriculture. They can further discover the social economic relations which are accountable for their high prices, and direct their efforts towards the rationalisation of such relations.

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1) A. Tschajanow, *Die Lehre von der bäuerlichen Wirtschaft*, 1923. S. 34.

Thus, the investigation of the cost of production not only furnishes a good guide to production and domestic finance in agricultural economy but affords valuable suggestions toward social economy. Bennett sums up the aims of such investigation as follows:—<sup>1)</sup>

1. To throw light upon the relationships of costs and prices in agriculture.
2. To provide a basis for legislative or administrative price fixing.
3. To provide a basis for scientific determination of tariff duties.
4. To elucidate the matter of agricultural prosperity by comparisons of various profit figures, such as profits per bushel in different years, per farm between different areas, and generally between agriculture and other industries.
5. To aid in determining the fairness of railway rates.
6. To create a better mutual understanding between consumers and producers.
7. To provide producers' co-operative associations with a basis for determining what price to ask.
8. To determine whether or not prices are being enhanced by concerted action of producers.

The inquiry into farmers' cost of production has various aims such as are enumerated above; but in some countries such an inquiry is made with special regard for the objects bearing on private management. In matters of social economy also, the aims it has in view cover either all or only some of those set forth above.

Investigations into the cost of rice production in this country were made as early as 1899 to 1901 by the agricultural societies throughout the country. In 1918, an investigation was made by the Temporary Industrial Inquiry Bureau. Since 1922, the Imperial Agricultural Society has been conducting it. The object of the inquiry by the Imperial Agricultural Society is to furnish "one of the basic data necessary for the study and judgment of fair prices for products, fair farm rents, a fair incidence of public imposts, and the proper market prices for arable lands, with a view to promoting the improvement of agricultural

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1) M. Bennett, *Farm Cost Studies in the United States*, 1928. p. 31.

management by individual farmers, the farming of the agricultural policy of the State and the study of agricultural problems generally." It will be seen that it has for one of its objects the discovery of a basis for the judgement of the fairness of the price of rice. In an inquiry of this kind undertaken in 1930, however, the positive objective was adopted when the aim was proclaimed to be "to study the costs of rice production throughout the country so as to find the fundamental basis of settlement in the fixing of the standard price of rice."

The Department of Agriculture and Forestry has also decided, as the result of the revision of the Rice Law last year, to fix the lowest price of rice at a point considered proper within the limits of the disparity between the cost of production and 20 per cent. below *rissei* rice price<sup>1)</sup>. It is entirely at the option of the Department to choose this point within the specified limits, but the chief aim of the investigation of the cost of production is, so to speak, to find the proper standard for the lowest market price. The inquiry by the Imperial Agricultural Society has the same object in view. In both cases, the underlying motive is to guarantee a price which can compensate for the cost of production for the benefit of producers. The cost of production in either case means the average of the costs of production per *koku* of rice for all farmers. As to the propriety or otherwise of taking the arithmetical mean as the average, I shall have something to say later on. Theoretically speaking, the determination of the price of rice by the cost of production means, in effect, the determina-

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1) *Rissei* rice price is the standard price of rice for each year, in which the trend of the price of rice is duly considered in conjunction with the index number of general prices. If the market price of rice fluctuate 20 per cent. higher or lower than the *rissei* rice price, the Government can purchase, sell, exchange, work up rice or stock rice in order to regulate the market price of rice by the Rice Law. Y. Yagi, On the Fixing of a Standard of the Price of Rice (Kyoto University Economic Review Vol. V. No. 2., 1930) p. 80 ff.

tion of the price of rice by the marginal cost of production. The price worked out by this means represents the normal price. The cost of production worked out by both the Department of Agriculture and Forestry and the Imperial Agricultural Society is designed to form the lowest limit of the actual market price. It is intended as a standard by which to regulate the price of rice. That is to say, when the market price falls below it, the Government proposes to purchase rice at the current price so as to force up the market price to this standard. I shall first explain the marginal cost of production which agrees with the normal price of rice, and then proceed to study the relation between it and the cost of production which is sought as the lowest standard of price.

## 2. THE RELATION BETWEEN THE COST OF RICE PRODUCTION AND THE PRICE OF RICE

In a capitalistic economic society, all commodities are produced through the combined operation of various factors of production. By the cost of production is here meant the expenses required for bringing about the combined working of the various factors necessary for the production of a unit quantity of a commodity. This expense is what is needed by an enterprise fit for the production of the commodity in question for its regular and continuous supply without incurring a loss. In this sense, it may be called the supply price of the commodity. In a typical enterprise for the production of commodities, the defrayal of the cost of production is made with money. For in such an enterprise the circulation of the produce takes the form of "currency—commodity—currency," and besides, actual cultivators and suppliers of capital and land exist separately from agricultural industrialists, as labourers and capitalists and landowners respectively.

In the economy of small farmers, which mainly depends on family labour, labourers are the subject of the enterprise

and there is no actual disbursement of money in the shape of wages. In the case of peasant proprietors who cultivate land belonging to them, there is no actual disbursement of money as rent. Moreover, the whole of the produce is not marketed. At least, a part of the produce is consumed by themselves as use value in its natural state, with the inevitable result that the items of cost of production include, besides actual disbursements of money, expenditure of money as estimated. This fact renders difficult the task of reckoning the cost of production in the economy of small farmers. Since, however, the cost of production essentially embodies a pure concept of enterprise, such outlays must be regarded in exactly the same light as actual disbursements of money. In this case, the material outlay to be estimated as disbursements exist objectively.

The object of a capitalistic enterprise is to realise the largest possible profit. In the formula, "Gross return—(material outlay+wages)=net return,"<sup>1)</sup> the net return must be the average profit rate at least. Otherwise, the enterprise cannot be maintained long in a world of free competition. On the other hand, the objective of small farm management, which depends on family labour, is taken to be the acquisition of the largest possible earnings for the family labour. In this case, the formula will be: "Gross return—material outlay=remuneration for family labour." As already noted, the remuneration for family labour must at least be large enough to secure for the family concerned for the production and re-production of the labour of the family the necessities of life which are socially required. Inasmuch as agricultural economy is interwoven into the market to-day, farmers cannot obtain all of the necessities of life from their own produce; they must turn to the market for the supply of some of them. Consequently, family labour is by no means devoid of prime cost. It is rather clearly conditioned by the objective physical goods or commodities such as have

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1) Vgl. Tschajanow, a. a. O. S. 38.



already been explained. Such being the case, in agricultural economy, as in all else, the cost of production is the expense required for bringing about the combined working of the various factors of production necessary for the production of a unit quantity of the commodity concerned. For in case the price of their produce falls short of this expense, farmers cannot carry on their agricultural production without lowering their social standards of living, with the natural result that they are then unable to maintain the regular supply of their agricultural products. Accordingly, this expense constitutes the cost of production and means the supply price of such commodities.

They say that the prices of agricultural products are controlled by the cost of production, but this simply means that the prices of agricultural products tend, after all, to accord with the cost of production for the marginal part of supply. For if these prices exceed such cost of production, production in the next and later years will be expanded beyond the past marginal limit, while, on the contrary, if they fall below such cost of production, production will be reduced to a point below the marginal limit, with the result that prices will find their level at the marginal cost of production. The theory that the prices of agricultural products are determined by the marginal cost of production is true only in regard to the prices over a long period. It does not apply to prices over a short period or to seasonal prices.

In commodities like rice which are harvested once a year, the amount of supply for the year is definitely fixed by the size of the harvest. Strictly speaking, of course, the amount of supply depends somewhat on the quantity of the cereal brought over from the previous year and on the extent to which farmers are willing to put their stocks on the market at the ruling market price, but the amount of supply is, on the whole, fixed. Now, as to the annual demand for rice. It is true that seasonally there is a fairly large measure of elasticity in the demand on the part of

rice merchants, which brings about temporary fluctuations in price, but as elasticity is lacking on the part of consumers, the price of rice for the year following the harvest is, generally speaking, determined by the quantity of the supply, and the cost which was involved in producing this amount of supply is left out of consideration. If the matter is considered in the light of the short period of one year, the farmer has no alternative but to sell his produce at the ruling market price, no matter whether it is above or below the cost of production.

A somewhat different interpretation is possible, however, when the matter is considered as covering a long period. This is especially so in regard to the supply. The supply in this case means the quantity to be produced, a quantity which can be manipulated by producers according to their lights. From this point of view, the price has a tendency to find its level at a point where its functions, the rate of production and the rate of demand, are balanced. Thus, commodities, if stretched over a prolonged period, will not be consumed more quickly than they are produced, nor will they be produced more quickly than they are consumed. This equilibrium does not necessarily exist in a limited duration of time. The expansion or contraction of production, that is to say, the function relations between the expansion or contraction of the supply and the price is a most complex problem in price theory. The expansion of the production of a commodity is conditioned both by changes in the productive power of a society as a whole and by the influx of productive power (capital and labour) from other branches of industry. It is usually through the latter process that production is expanded in order to meet an increased demand for a certain commodity. Since the transfer of the factors of production from one branch of industry to another takes a fairly long time, however, the equilibrium can only be established between demand and supply after a prolonged period. The price arising in an equilibrium over a long period is the normal price which

accords with the marginal cost of production. But what is usually called the normal price cannot be discovered in actual life, nor can it be worked out statistically. Bennett says: "It is not an average of daily, weekly, monthly, or yearly prices over a period of fifty years. Perhaps the closest statistical analogy to normal price would be a curve fitted free-hand to a series of average yearly prices."<sup>1</sup> This view cannot be readily accepted either. For as I shall have occasion to discuss later on, agricultural production, by reason of its peculiarities, is not amenable to quick expansions or reductions according to the prices ruling, and especially in a limited agricultural economy, in which curtailment of production is more difficult than its expansion, there is reason to believe that the average of prices is apt to be below normal.

The production of commodities to-day depends on the economic activity of producers who are swayed by motives of pursuing the highest possible profit. It is in this connection only that the cost of production influences price. That is to say, if the cost of production affects price, it is simply because price affects the supply. It is because production is either expanded or curtailed as the price exceeds or falls below the marginal cost of production that the cost of production controls price for a long period. From this point of view, it may be concluded that the cost of production which controls the supply—and accordingly price—embodies the outlays of money for purposes of production, which, in effect, means the payments made for the use of the various factors of production. Moreover, it has nothing directly to do with the pains that attends production or subjective sacrifices, for such subjective pains cannot be converted into objective expenditure which supplies the basis of judgment by the industrialist as to whether or not he should produce a certain commodity or, if he does, on what scale it should be produced. Thus, the cost of

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1) Bennett, *op. cit.*, p. 187.

production resolves itself into the objective expense which the industrialist pays for the use of the requisite factors of production. Under a capitalistic economic system, in which the private ownership of land is recognised, therefore, the rent to be paid for the use of land, which constitutes a means of production, ought to be included in the cost of production, so long as agricultural production is conducted on leased land. Yet, the price of agricultural produce is determined, to all intents and purposes, by the marginal cost of production which does not include land rent (differential rent). Now let me explain why land rent ought to be included in the cost of production.

Let land rent be confined to differential land rent. Where free competition prevails, the supply price of the agricultural product over a long period becomes equal to the marginal cost of production. This marginal cost of production is equal to the cost of producing one unit of a product on the part of the producer who has no differential advantages whatever for production (in respect of the fertility of farm land and of the distance to the market), and consequently who has no need of paying land rent. And in the state of equilibrium over a long period, all units of the product in question are sold at a price equal to the above mentioned marginal cost of production. The producer who has differential advantages and whose costs of production (exclusive of land rent) which produce various units are smaller than the above-mentioned price, can secure a surplus corresponding to the balance between his own cost of production (exclusive of land rent) and the marginal cost of production, and this is transformed into land rent. In the state of equilibrium over a long period, therefore, if land rent is included in the cost of production, the marginal cost of production becomes equal to the average cost of production.<sup>1)</sup> That is to say, the cost of production on the part of the cultivator of land of superior quality can be

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1) J. Viner, Cost (Encyclopædia of the Social Sciences, Vol. IV.) p. 471.

brought into line with the marginal cost of production by the payment of land rent. The differential land rent operates to average the cost of production. For this reason, "The curve of costs excluding land rent slopes upward, but the line representing costs defined to include land rent is a horizontal line."<sup>1)</sup> To be more exact, the cost of production for all units of products averages when land rent is added to it. This average cost of production is found equal to the marginal cost of production. In this respect, Professor Marshall says: "The aggregate expenses of production might then be found either by multiplying these marginal expenses by the number of units of the commodity; or by adding together all the actual expenses of production of its several parts, and adding in all the rents earned by differential advantages for production. The aggregate expenses of production being determined by either of these routes, the average expenses could be deduced by dividing out by the amount of the commodity; . . . . ."<sup>2)</sup> Thus, in the state of equilibrium, the curve of costs per unit of a commodity becomes horizontal by adding land rent to the cost of production, and the average cost of production found in this way coincides with the marginal cost of production.

Marshall also says: "If the cost of production were estimated for parts of the produce which do not come from the margin, a charge on account of rent would of course need to be entered in this estimate; and if this estimate were used in an account of the causes which govern the price of the produce, then the reasoning would be circular. For that, which is wholly an effect, would be reckoned up as part of the cause of those things of which it is an effect."<sup>3)</sup> In another part of his book, he further says: "The price of the produce is equal to the cost of production of that part of it, which is raised on the margin, that is under such unfavourable conditions as to yield no rent. The cost of this part can be reckoned up without reasoning in a circle; and the cost of other parts cannot."<sup>4)</sup> Seeing that differential rent represents the effect of the price, not the cause, it is obvious that the cost of production for parts other than the margin cannot

1) Bennett, op. cit., p. 199.

2) Marshall, Principles of Economics, 1922. p. 810.

3) *ibid.* p. 427.

4) *ibid.* p. 499.

be reckoned up without involving reasoning in a circle. But as regards the differential rent which is actually paid, it being fixed by a farm tenancy contract before the sale of the agricultural produce, that is, before the price is determined, it is but proper that land rent should be included in the cost of production, so long as the cost of production is interpreted as the expense paid by the farming industrialist for the use of the factors of production. Indeed, it would be impossible to find the marginal cost of production without doing so, for we have no means of working out the cost of production for the marginal part in any direct way. It cannot, however, be denied that, theoretically, this method of calculation involves reasoning in a circle.

Furthermore, under the system of private ownership of land, absolute rent sometimes arises, besides differential rent. In case all the lands in the country have passed into private hands, leaving no more free land available for cultivation, landowners will not lease even a piece of land of the worst kind without charging some rent, and this land rent will necessarily operate to force up the price of the produce to that extent. That is to say, the marginal cost of production must needs rise to the extent of absolute land rent. In such a case, this increased marginal cost of production determines the market price. In the state of prolonged equilibrium (denoting the period covered by the renewal of a contract for lease of land more than once), there is a tendency for absolute rent per unit of the produce in any land to become equal. For the landowner can demand such absolute rent as will make each of his investments in lands of various kinds equally profitable, or in other words, as will make the cost of production (including both differential and absolute rents) per unit of the produce equal. So, even if absolute rent is paid, the cost of production (in which both absolute and differential rents are included) per unit of the produce will be equalised. We can, therefore, find the average cost of production equal to the marginal expenses by dividing the amount of the commodity the aggregate of all the actual expenses of production of its several parts with all the land rents (as a matter of practice, both rents being paid as one whole, it is impossible to discriminate them) added, as Marshall maintains. As absolute rent is the cause, not the effect, of the price of agricultural produce, the average expense can be found without reasoning in a circle, in so far as absolute rent is concerned.

As will be clear from what I have already explained, it is in the state of equilibrium of demand and supply over a long period that the price of agricultural produce is determined by the marginal cost of production, and the price formed in this case is normal price. For such an equilibrium to come about, it is essential that the factors of production—land, capital, and labour—should be so advantageously coupled as to ensure the highest return for the farmer, and

that, moreover, there should be the smooth transfer of these factors from one branch of industry to another. The greater the coefficient of friction in regard to this transfer, the slower will it be for the equilibrium to come about. In the actual operation of agriculture, especially in the operation of small farms in this country, the transfer of the factors of production can take place only very slowly, and the process of equilibrium being established between demand and supply is very tardy.

As already stated, the extent to which the cost of production controls price depends entirely on the supply function which varies according to fluctuations in the price, provided there is no change in the demand; and this hinges on the extent to which agricultural production is affected by price. The expansion or contraction of agricultural production can be viewed from two angles. One refers to the scope of agricultural production, that is, the expansion or reduction of the area under crops. The other refers to the increase or decrease of labour and capital investments per unit area, or, in other words, changes in the degree of intensiveness. How far these two factors operate depends on (1) the profitableness of agricultural production work, (2) the extent of commodity production by agriculture, and (3) relative profits accruing from competitive crops for farm land. And as in the organic production of agriculture natural phenomena play an important part, the wishes of farmers to expand or reduce production cannot be faithfully reflected in the actual amount of production or in the amount of supply.<sup>1)</sup> Such being the case, we can only deduce the extent to which artificial means has been used to expand or reduce agricultural production from the changes in the acreage of the land under crops and in the degree of intensiveness, which are caused by fluctuations in the prices of agricultural products. But it is absolutely

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1) Belschaw, *The Profit Cycle in Agriculture* (*The Economic Journal* Vol. XXVI. March 1926) p. 29.

impossible to make any accurate estimate of yearly changes that take place in the degree of intensiveness in the production of any particular agricultural product. The area under rice in this country increases at practically the same rate every year. Despite the sharp fluctuations to which the price of rice is subject, there is very little change in the increasing rate of the acreage of rice fields every year. Even where some changes are observable, there are practically no indications that these increases or decreases in acreage operate to bring about the balanced demand and supply by influencing the amount of supply. The reasons for this may, perhaps, be found in the following circumstances: (1) In Japan, rice plants are mainly grown in wet fields, and as there are few crops that can be grown profitably in paddy fields, it is impossible to abandon rice cultivation immediately, even if the price of rice fall below the cost of production. (2) In agriculture, overhead cost, that is to say, outlays involved regardless of the amount of production, such as farm rent, taxes, and the depreciation account of agricultural implements, are fairly heavy, and so it is difficult to reduce the cost of production immediately by restriction of output when the price of rice has fallen. For this reason, the reduction of output is, as a matter of fact, impossible. (3) As family labour is predominant in small farm work, it is impossible to restrict production by the reduction of workers, as is done in factory production, even when the price of rice has fallen below the cost of production. Small farmers need a certain amount of money for the purchase of the necessities of life in order to maintain their family labour. When the price of rice has fallen, they rather strive to increase production by putting more labour into the work so as to make good the loss resulting from the decline in the price by increased units of production. The extent to which this is done, of course, depends, on the one hand, on the existence or non-existence of subsidiary work or other temporary employment to which the family labour can be transferred more



profitably, and on the ratio of the prices of necessities for the maintenance of family labour to the price of the rice which they can put on the market, on the other. (4) Fluctuations in the price of rice are caused at once by the state of the harvest and by economic conditions in general, and as it is difficult to forecast the price of rice in the next year, no farmer attempts to increase or reduce production on the basis of such a forecast. Even if some farmers attempt to do so, their plan is doomed to failure, as the producers are so numerous that it is impossible to ensure concerted action. Due to these circumstances, there is little likelihood of the supply of rice being controlled by the operation of the will of the farmers. The supply of rice is dictated rather by the rich or poor harvest of rice, which depends on climatic conditions. Furthermore, an increase or decrease in the supply of rice due to the state of harvest does not occur in such a favourable way as to conduce to the maintenance of a balance of supply and demand. The inevitable result is that the price of rice is left at an inequitable level for a long period. Such being the case, it is difficult for the supply of rice to be controlled by the will of the farmers so that an equilibrium can be established between supply and demand, and a normal price, which is equal to the marginal cost of production, be brought about.

Furthermore, large quantities of Korean and Formosan rice which is produced at lower cost than Japanese rice are now imported into Japan. Of course, the imported Korean and Formosan rice, influenced by the price of Japanese rice, sells at a somewhat higher price than its cost price in the producing centres, but the fact cannot at the same time be impugned that the price of Japanese rice falls below the normal price under the pressure exerted on it by the lower-priced Korean and Formosan rice. In a word, the condition of "an isolated country" which constitutes the premise of the marginal cost theory has already ceased to exist. So long as the normal price of Japanese rice is taken to be equal to its marginal cost of production, it seems fair to

conclude that such normal price is at a level somewhat higher than the long-term trend curve of the actual price of Japanese rice.

### 3. THE COST CURVE OF THE PRODUCTION OF RICE

In the foregoing chapter, I have made clear what mean by saying that the price of rice is determined by the marginal cost of production. It may be understood that it is this marginal cost of production that is sought as the standard by which to regulate the price of rice. But as we have no direct means of working out the marginal cost of production, we have, as a matter of fact, to fall back upon the method of adding together all the actual expenses of the production of the several parts of the commodity, add in all the rents and then deducing the average expenses by dividing the aggregate of the expenses by the amount of the commodity. In a long-term equilibrium this average cost of production agrees with the marginal cost of production. The method to be adopted for working out the average cost of production in this case must be that of finding arithmetic mean.

As already mentioned, in a long-term equilibrium the line representing costs defined to include land rent is horizontal. Actual investigations into costs will, however, reveal the fact that no matter how accurately the cost of production may be calculated, its curve line does not form a horizontal line, but slopes upward. This is partly due to the absence of equilibrium between demand and supply at the time when this investigation was being conducted, but as other contributory causes the following factors may be mentioned: (1) In the formation of the theory of land rent, the possession of a uniform capacity for enterprise by all farm industrialists is assumed, but, in reality, such is very far from the case. Differences in the capacity for enterprise on the part of farm industrialists give rise to quasi-land rent, which is a sort of producers' surplus.<sup>1)</sup> (2) Actual farm rent—farm rent in this country especially—does not necessarily agree with theoretical land rent. Inasmuch as actual farm rent is determined by the relative social prestige of landowners and tenant farmers, and as, moreover, farm rent in Japan

1) Taylar, *Agricultural Economics*, Chap. XVII.

partakes largely of the nature of metayer rent, it is by no means rare that actual farm rent exceeds theoretical land rent. Cases are possible where farm rent contains, besides theoretical land rent, profit or part of wages which is properly due to the tenant farmer. This being so, if, when investigating the cost of production, the tenant farmer's labour is appraised in terms of money and included in the cost of production and if unreasonably high farm rent is also appraised similarly and included in it, the part of wages will inevitably be doubly reckoned. (3) Theoretically speaking, it is assumed that under free competition the law of one price for one commodity operates, but in the investigation of the actual cost of production this law is found not in operation, for, when converting the amount of rice produced, means of production and farm rent into money, different rice prices at farm are taken as the bases of calculation in different districts. This causes divergences in the cost of production per unit of the produce. (4) In theory, the normal yield of rice is presupposed in the fixing of land rent and normal price, but the state of harvest differs according to provinces. So, differences occur in the cost of production per unit, which is found by dividing the cost of production of each agricultural family by the unit quantity of the produce (which is different as the state of harvest differs) which is not the same for all families. (5) In the investigation of the cost of production for peasant proprietors especially, the interest on land capital is usually taken into account, and while the Imperial Agricultural Society takes a certain percentage of the market price of agricultural land as such, the Department of Agriculture and Forestry takes the monetary equivalent of ordinary farm rent for kindred land (exclusive of taxes and other public imposts). But the concept of land value is ruled by the monetary value of theoretical land rent, as obtained by reducing it to the amount of capital by a certain interest rate, but as the market value of farm land usually departs from its profit-making value either upwards or downwards, and also as kindred land farm rent does not accord with theoretical land rent, the curve of the cost of production for peasant proprietors cannot form a horizontal line.

On the other hand, it is impossible to make inquiries into the cost of production in regard to each of over 5,000,000 farming families in this country and work out what Marshall means by the average cost of production (equal to the marginal cost of production). As, moreover, not all the farmers in Japan produce rice as a commodity according to capitalistic principles, those farmers who engage in agricultural pursuits in the face of many disadvantages and difficulties for the purpose of obtaining rice for their own consumption will have to increase the intensiveness of rice-producing labour beyond the reasonable limit (from the

capitalistic point of view) in order to maintain their standards of living, provided they are denied the opportunity of putting their own labour to more profitable uses. Accordingly, if this labour is to be included in the cost of production, the cost per unit quantity must of necessity become very high. But as the amount of supply which is decisive of the market price of rice must be interpreted as the quantity of rice which is marketed, the marginal cost of rice production must needs be construed as the marginal cost of producing the marketable rice. Thus, it seems fair to regard the average of many costs of production under ordinary management of rice growing business in typical rice-growing centres as the marginal cost of producing the rice to be marketed. The investigation of the Imperial Agricultural Society into the cost of rice production for 1930 was made about 771 agricultural families. Similar inquiries to be made under the revised Rice Law from the present year will be in regard to 1,030 farming families throughout the country. As only a little over 1,000 families are chosen out of a total of over 5,000,000 agricultural families for purposes of this investigation, the conclusion is inevitable that the object is rather to find the typical cost of rice production in this country.

Now I will show, by aid of the materials bearing on the costs of rice production of 681 farming families, supplied by the various prefectural agricultural societies, how the costs of production per *koku* of rice in respect of individual agricultural families are distributed (note 1), and examine what method is most appropriate for calculating the average cost of production. I shall further make out a curve similar to the cost curve from these materials so as to make clear how such accounting cost curve bears on the theoretical cost curve.

(Note 1.) These are the costs of production for 681 families, obtained from the materials of investigation into the cost of rice production in all prefectures in 1930. These families consist of 21 (Hokkaido), 15 (Aomori), 19 (Iwate), 21 (Miyagi), 23 (Yamagata), 18 (Fukushima), 26 (Ibaragi), 15 (Tochigi), 13 (Gumma), 10 (Saitama), 27 (Niigata), 18 (Toyama), 14 (Ishi-

kawa), 12 (Yamanashi), 24 (Gifu), 20 (Shizuoka), 30 (Aichi), 23 (Mie), 17 (Shiga), 15 (Kyoto), 38 (Hyogo), 9 (Wakayama), 10 (Tottori), 15 (Shimane), 20 (Okayama), 29 (Hiroshima), 20 (Yamaguchi), 12 (Tokushima), 19 (Ehime), 8 (Kochi), 37 (Fukuoka), 14 (Saga), 11 (Nagasaki), 20 (Kumamoto), 15 (Miyazaki), and 23 (Kagoshima).

The direct cost of production comprises the expenses for seeds, fertilizer, labour, various materials, and animal power, while the indirect cost of production consists of the expenses in respect of agricultural implements, buildings, taxes, and other levies, and interest on land capital (3 per cent.). Discussion of matters of whether these items of expenditure are properly chosen or by what method of calculation the amount of expense of each item ought to be found, I shall defer to a future occasion. Here, I will confine my attention to a concrete study of the cost of production on the basis of the results obtained by the investigations hitherto made by the agricultural societies by their usual methods.

Now, I shall proceed to find the cost of production per *koku* of rice (interest on land capital being estimated at 3 per cent.) in regard to the above-mentioned 681 families, and make out tables of frequency distribution for groups with a disparity of two yen in order to find the skewness indicating the degree of distribution. At the same time, arithmetic mean, mode, and median will be sought. Table No. 1 shows the result.

Table No. 1.

Frequency distribution of the cost of production per *koku* of rice  
(Interest on land capital: 3 per cent.)

Cost of production per <i>koku</i> (1)	Frequency of farming families (2)	Cumulative fre- quency of farming families (3)	Cumulative percentage of families (4)
Yen	Households	Households	%
11—12.99	1	1	0.1
13—14.99	5	6	0.8
15—16.99	20	26	3.8
17—18.99	69	95	13.9
19—20.99	113	208	30.5
21—22.99	114	322	47.3
23—24.99	97	419	61.5
25—26.99	93	512	75.2

27—28.99	62	574	84.3
29—30.99	42	616	90.4
31—32.99	27	643	94.4
33—34.99	17	660	96.9
35—36.99	10	670	98.4
37—38.99	5	675	99.1
39—40.99	1	676	99.3
41—42.99	2	678	99.6
43—44.99	1	679	99.7
45—46.99	1	680	99.9
47—48.99	1	681	100.0
Arithmetical mean cost of production for 681 families		Standard deviation ( $\sigma$ )	¥5.08
	¥24.12	Coefficient of variability	29.10%
„ mode	21.92	Skewness $\left(\frac{M-\text{mode}}{\sigma}\right)$ (+) 0.4331	
„ median	23.37		

In Table No. 1, interest on land capital is put at 3 per cent. of land value, but under free competition to-day, a price which completely covers the indirect cost of production as well cannot always be expected. There are cases where the producer is obliged to sell his produce at a price which can only cover the special cost of production, that is, the direct cost of production, such as the expenses for materials, labour, and the wear and tear of business equipment. It is, therefore, impossible even for peasant proprietors to expect a market price which can, in all circumstances, cover the interest on land capital, which forms part of the indirect costs of production. This is especially so in the present times of depression. Table No. 2 shows the frequency distribution of the cost of production per *koku* of rice—which leaves the interest on land capital entirely out of calculation—in regard to the 681 families referred to.

Table No. 2.

Frequency distribution of the cost of production per *koku* of rice  
(Interest on land capital excluded)

Cost of production per <i>koku</i> (1)	Frequency of farming families (2)	Cumulative fre- quency of farming families (3)	Cumulative percentage of families (4)
Yen	Households	Households	%
9—10.99	16	16	2.3
11—12.99	37	53	7.8
13—14.99	121	174	25.6
15—16.99	132	306	44.9
17—18.99	136	442	64.9
19—20.99	86	528	77.5
21—22.99	65	593	87.1
23—24.99	51	644	94.6
25—26.99	18	662	97.2
27—28.99	11	673	98.8
29—30.99	5	678	99.6
31—32.99	3	681	100.0
Arithmetical mean cost of production for 681 families		Standard deviation ( $\sigma$ )	¥4.08
" mode		Coefficient of variability	22.67%
" median		Skewness ( $\frac{M-\text{mode}}{\sigma}$ )	(+) 0.0539

In Table No. 2 also, the frequency distribution flexes towards a higher cost of production, though the degree of skewness is far smaller than in Table No. 1, for which the exclusion of the interest on land capital is perhaps accountable. As is generally known, there is a wide difference in the market value of farm land between different farming districts as well as between purely agrarian and suburban districts. In both tables, however, the skewness is positive, though different in degree.

As the distribution curve of the cost of production per unit does not indicate a regular curve, the question arises, what kind of average ought to be taken. As already ex-

plained, when there is equilibrium between demand and supply, the average cost of production which is equal to the marginal cost of production, can be found by dividing by the total amount of supply, the aggregate of all the actual expenses of production in all parts of the rice supply plus all the rents. In this case, the arithmetical mean may properly be adopted. But whereas the object of the investigation of the actual cost of production is to find such marginal cost of production, what is really found by this investigation is rather the typical cost of production for the farmers of the country as a whole. Hence, the question arises, what averaging method should be adopted. It is only proper that the most representative cost of production, that is, the most typical cost of production, in the series of the costs of production for investigation should be chosen. Since a positive skewness is shown in both tables given above, it seems advisable to take mode rather than arithmetical mean as the representative value of the series. Of course, the representative nature of the average cost of production presupposes the frequency distribution of the cost of production and the existence of the proper mode. The dispersion of the costs of production hitherto investigated indicates (a) positive skewness, like the frequency distribution of wages and incomes. So long as frequency distribution has positive skewness, it is but natural that mode should show itself lower than arithmetic mean. But the Imperial Agricultural Society has hitherto invariably adopted the arithmetic mean method, and the Department of Agriculture and Forestry is also going to adopt this method. On what theoretical grounds then, can their adoption of this method be justified? Is it because they really believe that the average cost of production, which forms the marginal cost of production in the sense which I have frequently indicated, can be found by an examination of the costs of production of from a few hundred to a little over 1,000 families scattered in the country?

Attempts to deduce the accounting cost curve from the



data collected for inquiries into the cost of production are made in America, but such a cost curve indicates the relation between the cost of producing one commodity and the amount of the commodity produced. This curve is formed with the cost of production as ordinate and the cumulative percentage of production as abscissa, by working out the cumulative percentage of production of individual agricultural families, besides the cumulative percentage of farming families which have costs of production within certain ranges, as shown in Tables Nos. 1 and 2. Taussig regarded such a curve as marking an epoch in the progress of the study of cost and price and went so far as to declare that it is "one of the most promising steps for the advancement of economic science."<sup>1)</sup>

It is quite obvious that the accounting cost curve made out in this way should be essentially different from the theoretical cost curve. "The cost of production of a commodity with definite annual output," which Auspitz and Lieben lay down as the pre-requisite for the deduction of the theoretical cost curve, means "the minimum amount of money which the producer of this commodity must secure in order to produce this quantity without incurring any loss."<sup>2)</sup> In the cost curve they have in view, the ordinate indicates the cost of production and the abscissa the annual amount of the commodity produced by all producers. Changes in this abscissa therefore, indicate yearly changes in the scope of production. In the accounting cost curve, however, the abscissa shows the quantity already produced in a year or for a certain producing period. Such being the case, the theoretical cost curve contains a certain amount of conditional implications. That is to say, it implies that "if the annual (or other periodic) output of all the producers were so much, their total cost would be so much; if the annual output were so much again, the total cost would correspondingly vary and so on."<sup>3)</sup> On the other hand, the accounting cost curve indicates the definite fact that the producer who has been involved in so much expense for the production of a unit quantity of a commodity has produced such and such quantity of the commodity. Another point of difference between the two cost curves is that although the theoretical cost curve indicates the real function relation between changes in cost and the

1) Taussig, *A Contribution to the Study of the Cost Curve* (The Quarterly Journal of Economics, Vol. XXXVIII, 1924) p. 176.

2) Auspitz und Lieben, *Untersuchungen über die Theorie des Preises*, 1889. S. 5.

3) H. Schultz, *Statistical Laws of Demand and Supply*, 1928. p. 105 ff.

commensurate changes in the amount of production, the accounting cost curve does not, for the latter can never indicate that each unit of a commodity produced by one producer is produced at different costs (based on the operation of the law of diminishing harvests.)

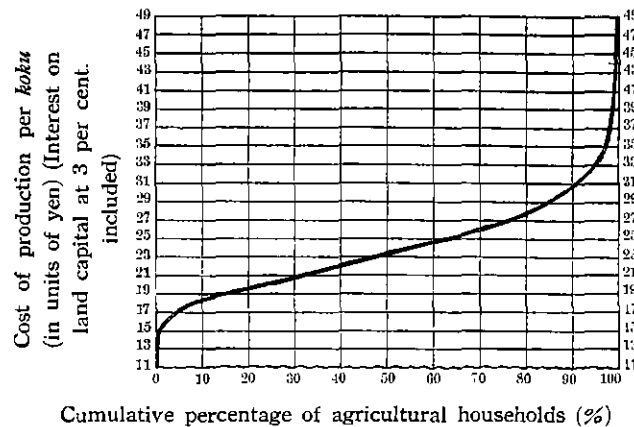
The practical value of deducing such accounting cost curve in the investigation of costs of agricultural production lies in the fact that it makes clear the idea of the so-called bulk-line.

The attempt to find such cost curve from the materials collected for investigations into the cost of rice production, which have hitherto been made public in this country, must be given up, because they do not furnish any data helpful to ascertain the amount of production by individual farmers who have certain amounts of production costs. But if the cumulative percentage of agricultural households as mentioned in Tables Nos. 1 and 2 is substituted as the abscissa for the cumulative percentage of production constituting the basis on which this cost curve is formed, a cost curve analogous to it may be obtained. Assuming the amount of production of each agricultural family to be the same in this case, it will agree with the accounting cost curve. From this analogous cost curve, we can see what percentage of the cost of production for all producers can be covered by such a price of rice.

On the basis of Diagram No. 1, given below, the arithmetical mean of the cost of production inclusive of interest on land capital is ¥24.12. If the price of rice is maintained at the same level as this, it will cover the costs of production for 54.9 per cent. of the total number of producers (681 agricultural families). If, on the other hand, the price of rice is equal to the mode, viz. ¥21.92, it will cover the costs of production for 38.2 per cent. of the total number of producers.

According to Diagram No. 2 given below, the arithmetical mean of the costs exclusive of interest on land capital is ¥18.01. If the price of rice rules at the same level, it can cover the costs for 55.1 per cent. of the total producers, while if it is equal to the mode, ¥17.79, it can cover the costs for 52.9 per cent. of the total. In short, this curve is

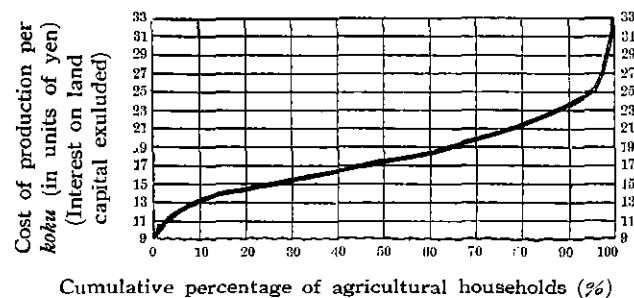
Diagram No. 1 (Cost curve of rice)



essentially the same as the accounting cost curve, and each point on the curved line merely shows the definite fact that agricultural families with certain costs of production constitute such and such percentage of the total.

If from the two tables already given, we are to work out, as the bulk-line of the cost of rice production, a margin which compensates for 80 and 90 per cent. of the total producers, it will be found to be ¥28.03 and ¥30.85 respectively when interest on land capital is included, and ¥23.61 and ¥21.37 respectively when it is not so included.

Diagram No. 2 (Cost curve of rice)



## 4. CONCLUSION

In the preceding chapters, I have made clear that it is when there is an equilibrium over a long period that the price of rice accords with the marginal cost of production and that in a country like Japan where small farmers are in the majority, it is difficult to bring about such an equilibrium quickly. I have also explained that although the objective of the investigation of the cost of rice production is to find the marginal cost of production, the actuality falls far short of the goal, and that as a matter of fact it rather tends to indicate the typical cost of production for all the farmers throughout the country. I have then emphasised the fact that in so far as this is the case, the question arises as to what method should be adopted for finding the average. There are many difficulties in the way of finding the accurate cost of agricultural production. This is why those who urge the necessity of investigations into the cost of agricultural production, being fully aware of these difficulties, do not put too much faith in the accuracy of the cost of production as worked out, and are rather content with the consciousness of its approximation.<sup>1)</sup>

Furthermore, the actuality in this country is such that there is a fear of the marginal cost of production sometimes rising above theoretical cost of production. The first reason for this is that as farm rent in this country exceeds theoretical land rent, and as cases are not altogether lacking where it includes part of the profit and wages which is properly due to the tenant farmer, there is a possibility of double entry of part of the wages in the cost of production. The second reason is that in the management of small farms, as in Japan, which depend mainly on family labour,

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1) Vgl. Laur, Die doppelte landw. Buchhaltung (Berichte über Landwirtschaft, Bd. VII. Heft 2) S. 204.

Studensky, Die Notwendigkeit der doppelten Buchführung und der Produktionskostenberechnung in der Landwirtschaft (Berichte über Landwirtschaft Bd. XIII. Heft 3, 1930) S. 450.

the appraisalment of labour in terms of money tends to make the cost of production too high, because, when farmers produce rice for their own consumption, they have to resort to excessive intensification of labour, if they have no opportunity of putting their family labour to profitable use elsewhere, and also because, on account of the use of the same paddy fields for the production of rice for their own consumption and for marketing, it is difficult to discriminate between them. The Department of Agriculture and Forestry is now investigating the cost of production to secure the basis of the lowest price level, as stipulated in Article 4 of the Rice Law. This lowest price is, of course, fixed at a point deemed proper by the authorities concerned within the limits of the difference between the cost of production and 20 per cent. lower than the *rissei* rice price. There is now a loud demand for the fixing of the lowest price with exclusive regard for the cost of production. Suppose that the marginal cost of production which can, theoretically, be taken as the normal price of Japanese rice has been accurately worked out by taking all the circumstances already described into full consideration. What would be the result, if efforts were invariably made by the Government to force up the price of rice through purchases of rice at the ruling market price, when the price falls below this level, in pursuit of the policy of maintaining the price above the marginal cost. The success of such a rice policy would certainly be a great blessing for farmers as they would then always be guaranteed the marginal cost of production, but it would be too optimistic to expect a Rice Law to achieve this successfully. Such a policy of affording excessive protection to agriculture would impede the technical progress of the cultivation of rice and hamper its rationalisation. Again, to force up the price of Japanese rice excessively would have the effect of increasing the rice crops in Korea and Formosa with the result that the increased supply of rice would defeat the object of such artificial raising of the price of rice. The pursuit of such a policy will put un-

bearable burdens on the nation and may even force the State to adopt the system of unemployment insurance such as is in operation in England. There must be limitations to the economic and the social policy to be adopted in a capitalistic State.

The present impoverishment of the farming population is due to the fact that in times of general depression, the prices of agricultural products to be marketed and those of the various factors of production constituting the cost of production do not fall at the same rate. The causes of bringing about such a phenomenon are to be sought in the organism of capitalistic production, namely, in the vicissitudes of the relative social influence of landowners and tenant farmers in agricultural communities, in the rival existence of small farm economy and the monopolistic tendency of capital, and in the defective system of distributing commodities. By way of expediting the recovery of the natural equilibrium between the economic forces generally, the State must do away with all measures designed to help the artificial increase of the prices of fertiliser by big capitalistic interests, while, at the same time, endeavouring to minimise delay in the decline of the cost of means of production (reduction of taxes, the lowering of railway freight rates and prices of tobacco, etc.). On the other hand, farmers ought to put greater energy into the work of rationalising production and the system of distribution by means of co-operative action among themselves, instead of relying too much on the State relief provided in the Rice Law.

YOSHINOSUKE YAGI.